



Climate Technology Centre and Network (CTCN) Technical Assistance
for the Development of an Urban Adaptation Plan for Kurunegala

Climate Change Adaptation Planning Manual For Kurunegala

CTCN Request No. 2018000009

Vol.8

September 2019

Kurunegala, Sri Lanka

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The Climate Technology Centre & Network (CTCN) has provided Technical Assistance (TA) to Kurunegala Municipal Council (KMC) and Ministry of Mahaweli Development and Environment (MMDE) in Sri Lanka through pro-bono support from Korea Environment Institute (KEI) Korea Adaptation Center for Climate Change (KACCC) and Green Technology Center (GTC) in Republic of Korea.

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1. Background

Climate change is a global trend affecting the lives of many people. Manifestations of climate change can be marked by the occurrence of extreme weather events (i.e typhoon and drought), sea level rise, and increased air temperature. The geographic location of Sri Lanka can significantly affect its susceptibility to the impacts of climate change. Germanwatch developed a global climate risk index to assess the vulnerability of countries to extreme weather conditions based on different indicators. According to Germanwatch's report, Sri Lanka ranked as the second nation most affected by climate-related disasters (Germanwatch, 2018). Other countries such as Puerto Rico, Dominica and Nepal were also threatened by increased occurrence of natural disasters due to the climate change.

From 1974 to 2004, combined incidents of drought and flooding affected approximately five million individuals in Sri Lanka (Ministry of Disaster Management, 2019). Seasonal flooding and drought were mainly caused by the uneven rainfall throughout the country.

Despite the heavy downpours for some periods, Sri Lanka has experienced drought since the beginning of 2016. This resulted in consequential damage in the agricultural, water supply, and power generation sectors (Ministry of Disaster Management & WFP, 2017). Compared to the previous year, 10% decline in the agricultural output of Sri Lanka was noted in the year 2016. This can be attributed to the simultaneous onset of seasonal flooding and drought, which primarily affected crop production in the affected areas (Ministry of National Policy and Economic Affairs & Ministry of Disaster Management, 2017).

Due to the inadequate rainfall, reservoirs were also depleted. The available water for irrigation dropped to as low as 22.2% in December 2016. Continuous dry spells may also affect the rate of groundwater recharge. Due to the growing demand and excessive groundwater abstraction, groundwater depletion and seawater intrusion can be also a threat to water supply sustainability. Among the regions of Sri Lanka, the North-western, north-central, and southern provinces were affected by the drought (Ministry of Disaster Management & WFP, 2017). Generally, the poverty-stricken sector of the population was the most vulnerable to the grave effects of climate change

a) Why adaptation?

Even if the greenhouse gas, which is the cause of climate change, is reduced, the effects of global warming due to the already released greenhouse gases cannot be avoided. (IPCC, 2007) In order to respond to climate change, it is necessary to reduce greenhouse gas emissions (mitigation) as well as adapt to changing climate (adaptation).

Local governments are parties that are directly affected by the effects of climate change. At the same time, they are key players in overcoming problems and creating opportunities. Exposure to climate change impacts and risks mainly affects infrastructure, services, social members (such as vulnerable groups) and vulnerable areas where local governments are responsible for management. Therefore, local governments should do their duty to adopt activities and associated measures to mitigate damages and prevent them from the impact of climate change.

The impacts and damages caused by climate change affect the quality of life and economic activity of citizens that are directly related to the competitiveness of the region. Therefore, local governments need to minimize negative damages and take advantage of positive opportunities from climate change through proactive and active adaptation measures. Local governments need to develop adaptation plans to identify vulnerable areas and classes in urgent need of adaptation and improve local adaptive capacity by reducing potential damage and risk.

b) Principles of Local Adaptation

Ten principles of Local Adaptation Planning (LAP) are shown as below.

- Minimize negative impacts of climate change and create new business opportunities
- Prevent from mal-adaptation and increase co-benefit of mitigation and adaptation
- Contribute to sustainable development
- Protect and manage vulnerable groups, sectors, regions, and infrastructures
- Protect and manage natural resources and promote local development by adaptation action
- Assess climate change impact, vulnerability and risk using scientific knowledge and technology
- Generate a synergy by linking and integrating relevant policies
- Consider effectiveness, efficiency, urgency, fairness, resilience of the adaptation plan
- Secure effectiveness and flexibility with a systematic monitoring and evaluation plan
- Strengthen an engagement of relevant stakeholders in developing adaptation plan

c) How to make your LAP successful

Here are five keys to success in LAP:

- *Integrated approach:* Adaptation programs and policies need to be closely linked to and integrated with social and economic activities
- *Consider different stages and areas:* Planning and implementation of actions need to consider the spatial scope (e.g. national, regional and sectoral level) and their impacts (e.g. environment, economy and science).
- *Two-way approach:* Findings from bottom-up and top-down approaches should be integrated in LAP.
- *Governance and Partnership:* It is essential to ensure the participation of all relevant stakeholders including national and local governments, academia and industry.
- *Flexibility and Feedback:* Due to the uncertainty of climate change, it is necessary to regularly revise LAP based on the monitoring and evaluation.

d) Contents of the LAP:

- Matters concerning the current status and characteristics of the region and the current status and prospects of climate change
- Matters related to the current capacity of climate change adaptation in the region
- Matters concerning the selection of key areas of weakness and items in the region
- Matters concerning the vision, goals, and detailed strategies for adaptation to climate change
- Matters concerning the discovery and selection of adaptation measures by sector
- Matters concerning establishment and confirmation of annual detailed implementation plan of adaptation measures
- Matters concerning the execution and management of the plan

e) About this LAP Manual

This LAP Manual extracted the main contents of Korea's "Guidelines for Establishing LAP to Climate Change (Korea Ministry of Environment, 2013)". It may not fit the situation of other countries as it is written in consideration with the reality of Korea's local government. But the main process of creating LAPs will help other countries. Each step can be adjusted according to the circumstances. This LAP Manual is designed to help individuals, families, businesses, communities, and local governments think about the meaning of climate change at local level, assess vulnerabilities/risks and develop strategies for enhancing resilience and local tools for adaptation. The manual is intended for local planning officials. But other potential readers could be professionals, community organizers, teachers or anyone interested in local adaptation.

2. Planning Steps and Detailed Procedures

Process of the LAP consists of the following three stages: preparation, planning, and implementation. Table below shows stages of LAP and associated steps and details.

Table 2-1) Process of Local Adaptation Planning (LAP)

Stage	Step	Details
Preparation	1. Preparation of LAP	<ul style="list-style-type: none"> 1.1. Building awareness of climate change adaptation (CCA) 1.2. Organizing a task force (TF) team for LAP
Planning	2. Identifying climate change risks	<ul style="list-style-type: none"> 2.1. Understanding of the general characteristics of the city 2.2. Current status and future outlook of climate change 2.3. Climate change impact and vulnerability/risk assessment 2.4. Comprehensive analysis and selection of key areas
	3. Setting goals	<ul style="list-style-type: none"> 3.1. Setting vision and objectives 3.2. Setting strategies for each key area
	4. Finding and selecting measures & establishing the plan	<ul style="list-style-type: none"> 4.1. Selecting adaptation measures for each key area 4.2. Preparing a detailed implementation plan
	5. Preparing action	<ul style="list-style-type: none"> 5.1. Developing foundation for implementation 5.2. Building monitoring and evaluation system
	6. Confirming and sharing the plan	
Implementation	7. Monitoring & Evaluation	

3. Seven Steps of Local Adaptation Planning (LAP)

3.1 Preparation of LAP

The objective of this step is to develop a framework for planning, such as raising interest and awareness in adapting to climate change and forming an organization for developing countermeasures in order to establish adaptation measure.

Partners for this step include various stakeholders in the region, including civil servants, city councils, public institutions, industry, academia, NGOs, etc.

3.1.1 Building awareness of climate change adaptation (CCA)

In the preparatory stage, it is important to establish a planning for environment, such as raising interest and awareness of climate change adaptation and deciding an organization in charge. Awareness of CCA is a crucial factor in establishing and implementing successful adaptation measures. Therefore, efforts should be made to induce interest in climate change adaptation and raise awareness from this early stage of the planning.

The main activities may include but not limited to:

- Draw attention and support from local government leaders, executives, and related departments;
- Prepare existing plans related to climate change adaptation measures;
- Secure the budget in consideration with the overall process of LAP;
- Enhance climate adaptation awareness and establish interdepartmental cooperation system through training and promotion.

It is critical to build sufficient consensus on adaptation by raising awareness and foundation for cooperation with relevant departments.

3.1.2 Organizing a task force (TF) team for LAP

A task force (TF) team should be organized to make LAP effective and efficient. It is essential to make an engagement of relevant stakeholders to the table. Relevant stakeholders include internal (local government) and external local stakeholders (such as experts, NGOs, industry and university). After forming the TF team, the TF operation plan (purpose and function)

should be outlined, and a specific role should be assigned to each participant. The key is that the TF should be actively involved throughout LAP process including consultations and reviews. In the case of Suwon city in Korea, the TF was composed of people from the Ministries related to health, disaster, agriculture, forests, marine/ fishery, water management, and ecosystem.

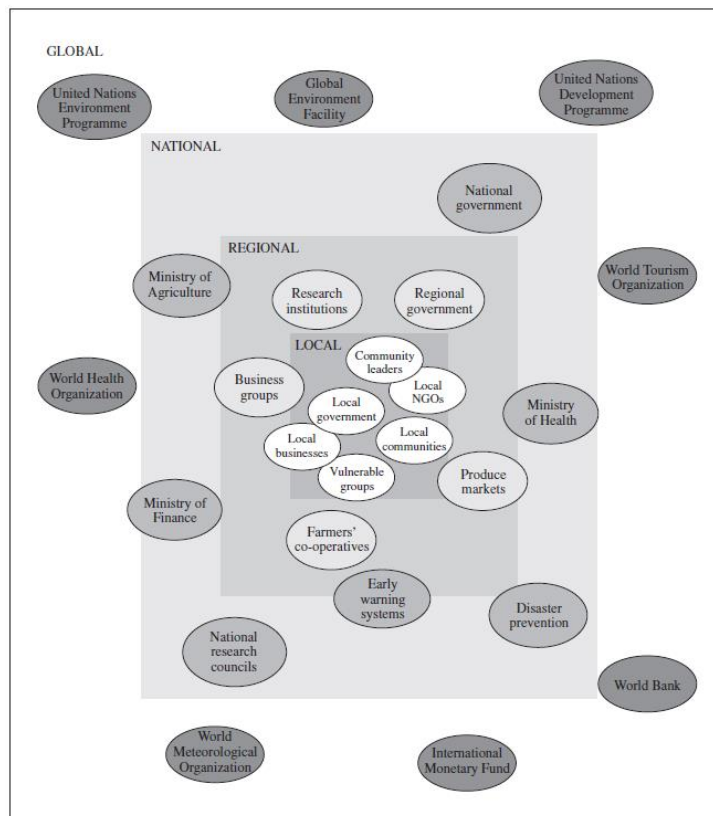


Figure 3-1) Stakeholder groups and institutional mapping

3.2 Identifying climate change risks

The objective of this step is to prepare the basis for establishing adaptation measures by using objective data and scientific methods. It includes identifying and predicting climate change impacts and vulnerabilities based on relevant data, such as climate temperature and precipitation data.

Local conditions and characteristics, the status and outlook of climate change, the effects of climate change and the results of vulnerability and risk assessment are derived at this step.

These are utilized as data and tools for decision making, such as setting direction (vision and goals) for adapting to climate change and establishing adaptive measures.

The step will be centered on those responsible for planning adaptation with weather, climate and other related experts participating.

3.2.1 Understanding of the general characteristics of the city

The characteristics of the city including natural, human and social environment are identified. Methods include related plans and reference document surveys, statistical data analysis, and field surveys. Formal data from existing surveys can be used, and it is recommended that the most recent data be used.

Besides, the central government plans related to adaptation and associated sectoral plans in the region are investigated and reviewed. For instance, adaptation policy trends, the stocktaking of adaptation projects and adaptation measures applied in each sector can be identified. Planning can be established by considering the link between central government plans and regional plans to prevent redundancy of policies and enhance the effectiveness of developing adaptation plans.

In this technical assistance, detailed analysis of the Kurunegala city is provided in the Deliverable 2 (Literature Review Report).

3.2.2 Current status and future outlook of climate change

After understanding the city, the next step to do is to know climate change trends. Changes in climate factors and extreme indices in the region based on the past and present data are analyzed, which will provide baseline data for future climate projections. With this, climate factors and extreme indices at a future time according to climate scenarios are also estimated. Future climate change can be then predicted based on the comparison with the baseline values. Through this step, necessity of LAP in the region can be introduced.

a) Current climate status

Based on the observational data, you need to analyze changes in climate factors (such as average temperature and precipitation, maximum and minimum temperature and precipitation, days of occurrence, etc.) of the city from the past to the present. Climate change-related extreme indices such as temperature-related extreme indices (including

tropical days, heat waves, frost days, freezing days and summer days) and precipitation-related extreme indices (including precipitation intensity and heavy rain days) are investigated. The analyzed current status of climate phenomena should be used to establish a baseline for forecasting future climate based on climate values at the time of planning.

b) Future climate projections

Climate factors and extreme indices at a future time are predicted based on climate scenarios. Changes in growth rate, distribution, deviation and trend (time series) of future climate change values (such as temperature, precipitation, extreme and singular mean values, maximum and minimum values and days of occurrence) are evaluated. Results of future climate projection predicted based on climate scenarios are then compared with the current climate status.

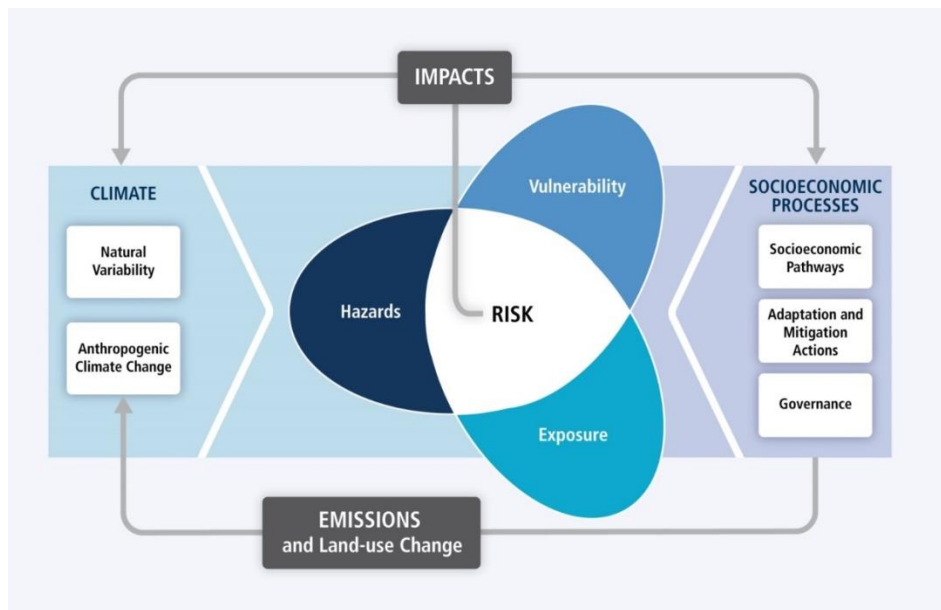
Note that the baseline and future prospects are set in consideration with the planned year. The baseline is set by using the current climate value, and the future forecast is set by using predicted climate units. By applying various climate change scenarios and analysis methodologies, the uncertainty of future climate change prospects can be reduced. For example, the table below shows current status and future outlook of climate change in Suwon city, Korea.

Table 3-1) Climate change in Suwon City, Korea

	Present (2001~2010)	(2041~2070)		(2071~2100)	
		RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5
Mean temperature (°C)	12.5 (11.2)	+1.6(+1.6)	+2.6(+2.6)	+2.2(+2.2)	+4.8(+4.8)
The highest temperature of the day (°C)	17.6 (17.1)	+1.5(+1.5)	+2.5(+2.5)	+2.0(+2.0)	+4.7(+4.7)
The lowest temperature of the day (°C)	8.2 (6.2)	+1.5(+1.6)	+2.7(+2.7)	+2.2(+2.2)	+4.8(+4.8)
Annual precipitation (%)	14373(1364.7)	+22.9(+23.5)	+32.7(+33.6)	+39.1(+33.8)	+33.4(+30.9)
Number of days of heatwave (day)	7.7 (8.3)	+12.6(+9.9)	+25.7(+21.2)	+19.4(+15.7)	+61.4(+53.7)
Number of tropical Night (day)	3.4 (1.4)	+21.4(+12.3)	+35(+22.5)	+31.2(+19.0)	+62.7(+47.3)
Precipitation intensity (%)	17.7 (16.7)	+75.0(+35.7)	+19.2(+20.8)	+29.3(+26.0)	+21.6(+19.2)
The number of days of heavy rain (%)	2.7 (2.9)	+16(+14.2)	+75.0(+127.3)	+114.8(+137.9)	+103.7(+113.8)

3.2.3 Climate change impact and vulnerability/risk assessment

According to the Fifth Assessment Report (AR5) (IPCC, 2014) by the Intergovernmental Panel on Climate Change (IPCC)¹, risk refers to the potential for consequences where something of value is at stake and where the outcome is uncertain, recognizing the diversity of values. Risk is often represented as probability of occurrence of hazardous events or trends multiplied by the impacts if these events or trends occur. The risk assessment is different by nations.



Source: IPCC (2014)

Figure 3-2) IPCC's risk

Climate change impacts observed from past to present are analyzed. It is vital to analyze characteristics and types of local climate change impacts in order to identify major issues (such as vulnerable areas and classes) and sectors. Current risk status and future prospects in major areas are then identified. By comparing and reviewing the current status and future prospects, the extent and trend of risk in major areas are assessed.

Local awareness of climate change adaptation is crucial for the smooth establishment and implementation of climate change adaptation measures, such as forming a consensus of the

¹ The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change

community on climate change adaptation measures, securing policy support and enhancing the reliability and validity of the planning results. In this sense, the level of local CCA awareness and information acquisition path is investigated. Particular attention should be paid to gender issues as women and girls are exposed to higher risks and burdens. By conducting a gender analysis and incorporating the findings from it, it is possible to address gender-related issues in adaptation action plan.

The results will be used to set the direction of an adaptation action plan and establish adaptation measures. In this technical assistance, climate change risk assessment was conducted, and results of assessment are presented in the Deliverable 3 (Report on the Result of Climate Change Risk and Vulnerability Assessment). Details on the methodology of the risk assessment used in this technical assistance are shown in the Deliverable 4 (Climate Change Risk Assessment Guidelines). Moreover, information on field survey to collect up-to-date data can be found in the Deliverable 6 (Consultant Workshop Report).

3.2.4 Comprehensive analysis and selection of key areas

This step aims to choose key areas to be prioritized in LAP. All the results from previous analyses as below are synthesized.

- General status and characteristics of the region;
- Climate change trends including past and current climate data and future projections;
- Climate change impacts including damages and losses to date;
- Climate change impacts and vulnerability/risk assessment results;
- Climate change adaptation awareness and opinions.

Based on the results, you need to draw current and future adaptation issues and identify focus areas for LAP. The issues and areas chosen here should be further discussed and reviewed through consultation with local stakeholders or at regional forums.

3.3

3.3 Setting goals

3.3.1 Setting vision and objectives

This step aims to set up long-term vision and objectives. Considering that climate change refers to long-term changes in the weather patterns in a region, the plan itself is to be based on the long-term projections of climate change. The vision and objectives of the adaptation plan provide direction that affects all decision-making of regional climate change strategies and associated adaptation measures; therefore, they should be set with mid- to long-term considerations (e.g. minimum 10, maximum 20 years). The following should be considered when establishing the vision and objectives in LAP:

- Current status of climate change;
- Prior studies and impact and vulnerability assessment.

The opinions from the consultative body, stakeholders and residents shall be collected and reviewed in order to enhance the reliability, justification and rationality of the LAP. In case of Yeonsu-gu, Incheon, Korea, the first results are drawn on the development direction based on the survey of residents and public servants, and set up through consultation with experts, responses to national climate change (2011-2015) and review of vision cases established by other local governments.

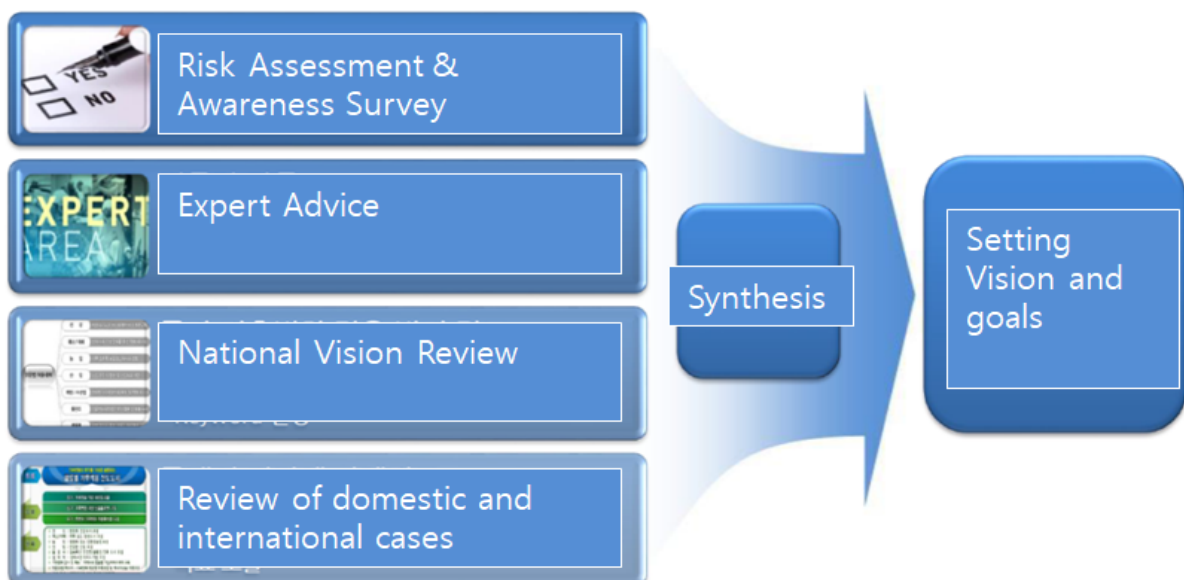
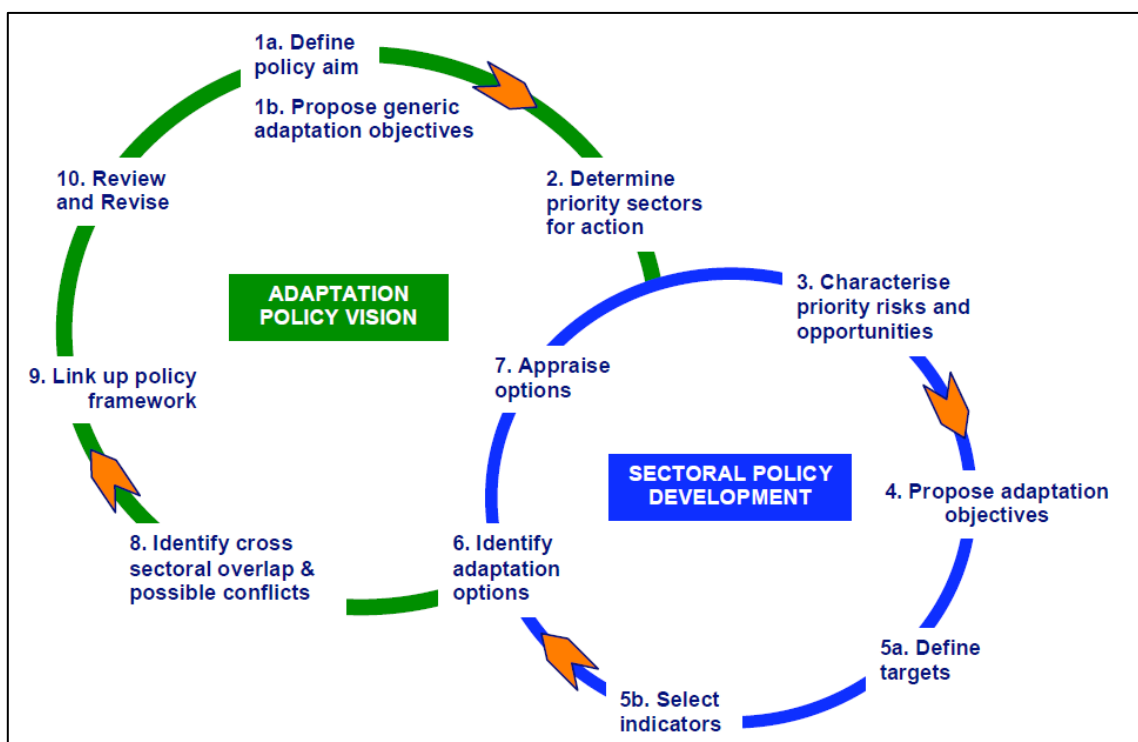


Figure 3-3) long-term vision and objectives of Yeonsu-gu, Incheon, Korea



Source: SEI (2005)

Figure 3-4) Linking adaptation vision with sectoral policy

3.3.2 Setting strategies for each key area

Detailed strategies need to be developed in consideration with the action period (e.g. 5 years) to achieve the vision and objectives of the adaptation plan set through the previous step. The detailed strategies for key areas are related to the implementation and monitoring of the adaptation measures at local level. Therefore, they should be established in consideration with the fact that they can be modified and supplemented according to local conditions in the future. It is necessary to review the validity, rationality, and execution capacity of the local government through the process of collecting opinions from various stakeholders. Stakeholders include professors, officials in charge, and employees in each field.

3.4 Finding and selecting measures & establishing the plan

3.4.1 Selecting adaptation measures for each key area

This step aims to identify and select adaptation measures for key areas. The first thing to do is to prepare an inventory, which is a list of potential adaptation measures to be applied in

the region. Considering regional status, climate change impacts, vision, and objectives, adaptation measures are evaluated through TF meetings and consultations with local stakeholders. It should be determined if existing measures are to be maintained and/or if there is any need to be corrected or improved. It is also identified whether new adaptation measures are required. After the evaluation, adaptation measures for key areas are selected.

3.4.2 Preparing a detailed implementation plan

A detailed (annual) implementation plan for each selected adaptation measure is prepared. A draft detailed implementation plan is circulated among related departments, and their opinions are collected. It is essential to share the draft and gather feedback from the departments in charge. Sufficient discussion and reflecting on their feedback will enhance the effectiveness of the implementation.

Some smart questions as below would help develop implementation plan of adaptation measures.

- Does this project promote synergy between different areas of adaptation?
- Is this project urgent right now?
- Does this project directly benefit the people?
- Is this project consistent with the direction of the central government's plan?
- Is this project consistent with the direction of the local government's plan?
- Will this project support the vulnerable people to climate change?
- Does this project consider supplementing existing projects?
- Is it a software-oriented project rather than a hardware-oriented project that needs a massive budget for implementation?

3.5 Preparing action

3.5.1 Developing foundation for implementation

This step aims to establish the grounds for implementing adaptation measures. It includes but not limited to establishing an institutional element and forming related organizations and governance systems. It is crucial to prepare the (annual) budget required for the

implementation of the selected adaptation measures. The table below is an example developed by Suwon city, Korea.

Table 3-2) Implementation of adaptation measures in Suwon city, Korea

Implementation Base	<ul style="list-style-type: none"> · [Organization] Review of organization and capacity related to adaptation measures · [Framework] Operation of relevant forums and establishment of sub-committee within existing relevant organizations
Governance	<ul style="list-style-type: none"> · [Requirement] A variety of stakeholders need to agree and support in terms of policy for the implementation of the detailed plan for adaptation measures · [Configuration] Constructed based on a governance system that includes various stakeholders (government officials, industries, NGOs, academia and research institutes and those responsible for adaptation measures (general) and related departments) · [Operation] Operation as a permanent organization in the form of a consultative body or a committee · [Roles] Consultation and review of the detailed implementation plan for climate change adaptation by local governments, adjustment of detailed action projects (reflecting current conditions), evaluation of implementation of the policy and action projects, etc.
Roles by subject	<ul style="list-style-type: none"> · [Central Government] Preparing laws and systems, supporting budgets for adapting to climate change, setting directions, supporting local governments, supervising the implementation of adaptation measures for local governments, etc. · [Local Government] Establishing and implementing adaptation measures for climate change, monitoring and evaluating detailed action projects (self-evaluation), laying the foundation for implementing adaptation measures at local government level, etc. · [industry] Application of adaptive policies and measures in industry sector, promotion of adaptation in the respective areas, support of administrative and resident activities, etc. · [NGOs] Operation of community education programs, monitoring regional issues and problems, monitoring policies, etc. · [Regional residents] Providing information on pending regional issues, participating in and implementing projects, monitoring policies, forming and operating communities, etc. · [Experts] Research on adaptation of climate change, status analysis and problem diagnosis, planning and major policy advice, business implementation and performance evaluation advice by sector, policy monitoring, etc.

3.5.2 Building monitoring and evaluation system

This step is to institutionalize the monitoring and evaluation of the performance of implementing adaptation measures. Each year, self-assessment should be carried out by a local government to evaluate the performance of the implementation plan for adaptation measures. The implementation plan should be revised based on the results of the self-assessment. The results should be also used to prepare the next year's execution plan. Through this step, a local government would actively respond to climate change uncertainty and regional conditions, enhancing the effectiveness and sustainability of implementation measures.

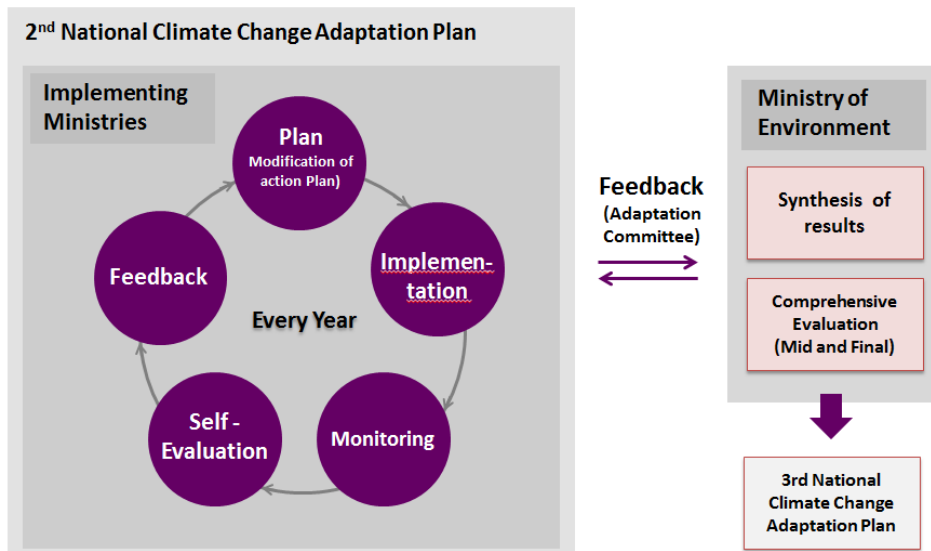


Figure 3-5) Monitoring and evaluation framework of the 2nd National Climate Change Adaptation Plan of Korea

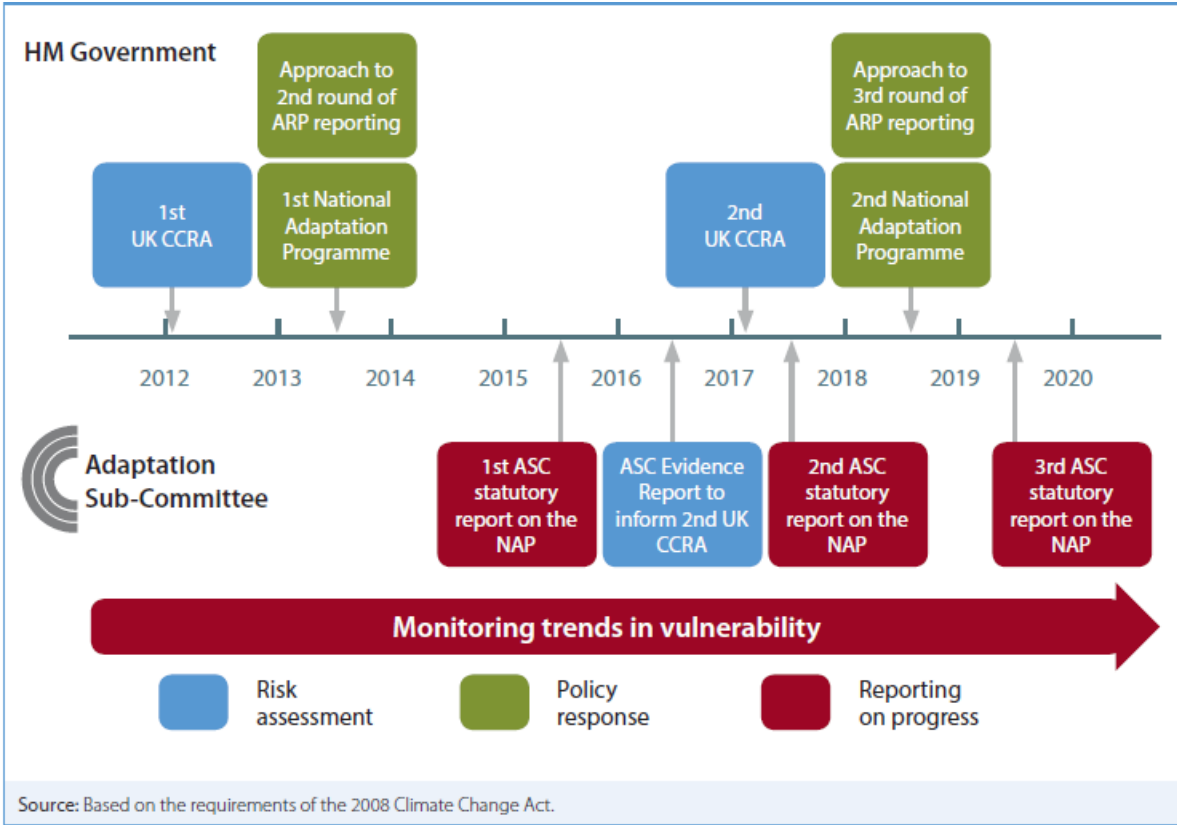


Figure 3-6) The UK adaptation policy cycle with an embedded monitoring system

3.6 Confirming and sharing the plan

This step is to confirm and declare the detailed implementation plan of the adaptation measures. The local government should prepare the implementation plan of the adaptation measures in earnest.

Detailed implementation plans of climate change adaptation measures are distributed to the relevant departments, and they are promoted internally and externally to enhance the implementation of adaptation measures at local level.

In parallel, local policy support for adaptation measures is also proceeded. This includes hosting related events such as campaigns to raise awareness of climate change adaptation and promoting adaptation measures using brochures

3.7 Monitoring & Evaluation

The objective of this step is to monitor whether the implementation plan has actually been implemented well. It will be monitored periodically according to the system mentioned in section 3.5.2 and will involve officials from all sectors of the local government.

● (EX) Sharing the results of NAP M&E

Climate Change Adaptation Working Group Meeting (Jun.29th, 2017, MOE meeting room)

- **(Objective)** Strengthening effectiveness of the plans and increasing the responsibility of the implementing ministries by evaluating and circulating the implementation result of climate change adaptation action plan
- **(Participants)** 23 officials from Central governments
- **(Discussion and Result)**
 - Review on budget execution rate as an indicator
 - Review on introduction of the evaluation system by external expertise
 - Amendment of (Detailed) Action Plans at a certain time
 - The usage of implementation results



Figure 3-7) Sharing the results of NAP Monitoring & Evaluation

4. Conclusion

Local Adaption Planning (LAP) can help local government and communities enhance their adaptive capacity to respond climate change. Through proactive and resilient responses to climate change uncertainty and changes in local conditions, customized adaptation measures can be identified and implemented at local level.

Annual performance evaluation as to the implementation of adaptation measures can diagnose the effectiveness of LAP and continuously update LAP to reflect climatic, economic and/or social changes at local level. Local adaptation capacity can be strengthened by improving and supplementing existing policies and applying new adaptation measures.

Through linkages and integrations with existing relevant policies and projects, synergy for local adaptation can be generated. LAP can contribute to improving capacity for climate change adaptation in community, citizens and public and private sectors. It can also open the window for positive opportunities and co-benefits of climate change in the future.

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